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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/501,947	02/10/2000	Stephen Peter Najda	YAMAP0696US	4581

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EXAMINER
FLORES RUIZ, DELMA R

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 01/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/501,947	STEPHEN PETER NAJDA	
	Examiner	Art Unit	
	Delma R. Flores Ruiz	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *19-23* is/are allowed.

6)☒ Claim(s) *1-18 and 24-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

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Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ ~~The drawing(s) filed on *11/05/2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner~~.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 8 – 12 and 24 – 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (4,916,708) in view of Hiroyama et al (5,963,572).

Regarding claims 1, 2, 4, 8 – 12, 18, and 24 – 3 1, Hayakawa disclose a laser device comprising an n-doped cladding region (Fig 1, character 54 (Column 6, lines 64 – 65)), and a p-doped cladding region (Fig 1, character 55 (Column 6, lines 66 – 67 and Column 7, lines 1)): an optical guiding region (Fig 1, character 72 (Column 7, lines 15 – 16)), disposed between the n-doped cladding region and the p-doped cladding region; and a active region (Fig 1, character 70 (Column 7, lines 11 – 12)), disposed within the optical guiding region; wherein the laser device further comprises at least one optical confinement layer (Fig 1, character 76 (Column 6, lines 25)), disposed between the

active region and at least one of the cladding regions, and wherein the laser device emits light in the visible region. A laser device, wherein the al least one optical confinement layer (Fig 1, character 78 (Column 7, lines 25)) is deposited at the interface between the optical guiding region and one of the cladding regions. A laser device, wherein at least of the one cladding region has a graded bandgap ((Fig 1, (Column 3, lines 7 – 64 and Column 7, lines 10 – 33)). A laser device, wherein the at least one optical confinement layer is disposed on the p-side of the laser device and is p-doped, second optical confinement layer disposed between the active region and the other of the cladding region and second confinement layer is deposited between the optical guiding region and the other of the cladding regions (Fig 1, and (Column 6, lines 63 – 68, and Column 7, lines 1 – 32)). A laser device, fabricated in the (AlGaIn) P system, with the one cladding region being formed of AlGaInP having an aluminum mole fraction y and y decreases away from the at least one optical confinement layer (Fig 1, and (Column 6, lines 63 – 68, and Column 7, lines 1 – 32)). A laser device wherein the light is in the range from about 630 nm to about 680 nm (Column 2, Lines 44 – 57). Hayakawa discloses the claimed invention except for a layer with a low refractive index. It would have been obvious at the time of applicant's invention, to combine Hiroyama of teaching a the optical confinement layer having a lower refractive index than the at least one of the cladding region with a laser device because a semiconductor laser device includes a cladding layer of a first conductivity type, an active layer, a cladding layer of a

second conductivity type opposite to the first conductivity type, and a low resistively layer (optical confinement layer) doped with impurity of the first conductivity type, having a stripe-like opening part with a certain width and having a smaller refractive index than the second conductivity type cladding layer and a bandgap energy higher than energy of lasing light in this order, wherein the low resistively layer has an impurity concentration of 5.times.10.sup.17 cm.sup.-3 or less at least in the region on the active layer side in the thickness direction. One of ordinary skill in the art at the time the invention was made would have found the advantage and desirability have a layer with a lower refractive index for improving optical and electrical effects of the system.

Claims 3 and 5, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (4,916,708) in view of Kidoguchi et al. (5,502,739).

Regarding claims 3 and 5, Hayakawa disclose the claimed invention except for the laser device, wherein the Γ conduction band of the part of the one cladding region immediately adjacent the at least one optical confinement layer is substantially degenerate with the x-conduction band of the at least one optical confinement layer and the composition of the one cladding region is selected such that the energy of the DX level in the one cladding region is greater than the Fermi level in the one cladding region. It would have been obvious at the time of applicant's invention, to combine Kidoguchi of teaching the Γ conduction band of the part of the one cladding region immediately adjacent the at least one optical confinement layer is substantially

degenerate with the x-conduction band of the at least one optical confinement layer and the composition of the one cladding region is selected such that the energy of the DX level in the one cladding region is greater than the Fermi level in the one cladding region with laser device because the quasi Fermi level of the conduction band during laser emission can be decreased, leak current which flows due to the diffusion of the carrier into the p-cladding layer can be suppressed, thus the low threshold current for the laser emission, operation at higher temperatures and higher reliability can be obtained. Also, because the multi-quantum well of the invention has a lower quasi Fermi level with the same carrier density in accordance to the higher state density, the current generated by emission recombination of the carriers near the band edge decreases. Although electrons having high energy in the conduction band are confined in the potential well of the low barrier section, they do not flow as an ineffective current because there are almost no holes in this region. Therefore the threshold current can be reached with less current even when the carrier density increases. Also, because the quasi Fermi level of the conduction band can be decreased, leak current can also be suppressed, thus low threshold current for the laser emission, operation at a higher temperatures and higher reliability can be obtained.

Claims 6 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (4,916,708) in view of Copeland (4,305,048).

Regarding claims 6 – 7, Hayakawa disclose the claimed invention except for the laser device, the DX level in the part of the at least one cladding region adjacent the at least one optical confinement layer is substantially degenerate with the X-conduction band in the optical confinement layer, the DX level in the one cladding region increases away from the at least one optical confinement layer. It would have been obvious at the time of applicant's invention, to combine Copeland, III of teaching a the DX level in the part of the at least one cladding region adjacent the at least one optical confinement layer is substantially degenerate with the X-conduction band in the optical confinement layer, the DX level in the one cladding region increases away from the at least one optical confinement layer with laser device because the decrease in loss that is achieved at the dominant mode wavelength is due primarily to the presence of a deep level DX center associated with each of the donors in the n-type cladding layer on one side of the active region. In the case of the laser reported in that article, the thickness of the active region was relatively small, in the order of 0.1 micrometer, and therefore much of the radiant energy was present in the cladding layer thereby permitting the deep level DX centers in the cladding layer to have an effect. An active region thickness of 0.1 micrometer is very low from the standpoint of achieving optimization of the threshold current. In this regard, it would be highly desirable to have a thicker active region. With a thicker active region, however, the deep level DX centers, due to the donors in a cladding layer, would have a considerably reduced effect on the radiant energy. It would therefore be highly desirable to achieve mode

stabilization by some technique other than the deep level centers contributed by the donors in the cladding layer.

Claims 13 – 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (4,916,708) in view of Hiroyama (5,963,572).

Regarding claims 13 – 17, Hayakawa discloses the claimed invention except for a laser device wherein the at least one optical confinement layer is an AlGaInP layer having a greater aluminum mole fraction than the respective cladding region, one confinement layer is an AlInP layer and the optical confinement layer consist of oxidized AlInP and for a laser device wherein y approximately 0.4 and 0.9 at the interface between the one cladding region and the optical confinement layer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to laser device wherein the at least one optical confinement layer is an AlGaInP layer having a greater aluminum mole fraction than the respective cladding region, one confinement layer is an AlInP layer and the optical confinement layer consist of oxidized AlInP, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. In AlGaAs semiconductor laser devices, Al composition ratios of the first and second conductivity type cladding layers are preferably selected in the range of 0.4 to 0.6 and the Al composition ratio of

the optical confinement layer is selected to be greater than the Al composition ratios of these cladding layers, preferably in the range of 0.42 to 0.62. It would have been obvious to one of ordinary skill in the art at the time the invention was made to laser device wherein y approximately 0.4 and 0.9 at the interface between the one cladding region and the optical confinement layer, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance: claim 19 has been allowed over the prior art because they fail to teach a semiconductor laser comprising; ***the composition of the n-type cladding region is selected such that the energy of the DX level on the n-type cladding region is greater than the Fermi level in the n-type cladding region***.

Claims 20 – 21 has been found allowable due to their dependency on claim 19.

The following is an examiner's statement of reasons for allowance: claim 22 has been allowed over the prior art because they fail to teach a semiconductor laser comprising; ***the active region disposed within the optical guiding region; wherein the energy of the DX level in one of the cladding regions increas s away from the optical guiding region.***

Claim 23 has been found allowable due to their dependency on claim 22

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reason for Allowance".

Response to Arguments

In response to applicant's argument that the prior art does not teach or suggest that the confinement layer with a lower refractive index than the cladding regions, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Applicant's arguments filed November 5, 2002 have been fully considered but they are not persuasive. Applicant argues that the prior art does not teach or suggest that the confinement layer with a lower refractive index than the cladding regions.

The examiner disagree because of the following reasons:

a) The claim recites that the confinement layer has a refractive index lower that ***at least*** one of the cladding layers and not both of the cladding regions.

b) Hayakawa suggest that threshold current of the device could be reduced (Column 2, Lines 60 – 65) which, as explain by applicant an page 3 of the Remarks, are the effects of the confinement layer having a lower refractive index. Therefore, one of ordinary skill in the art would have found obvious to specify that the confinement region could hace a lower refractive index as shown by Hiroyama for the purpose of having good characteristic of lasing threshold current and slope efficiency as shown by Hayakawa (Column 2, Lines 26 – 45) and suggested by Hayakawa (Column 2, Lines 60 – 65).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Delma R. Flores Ruiz whose telephone number is (703) 308-6238. The examiner can normally be reached on M - F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Ip can be reached on (703) 308-3098. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-3431.

Delma R. Flores Ruiz
Examiner
Art Unit 2828

Paul Ip
Supervisor Patent Examiner
Art Unit 2828

Drfr
January 24, 2003